Imagine….and act

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ORACLE

Today…
If you are driving across the desert and your car breaks down, the only guy who benefits is a heavily tattood fellow named Earl who owns the only repair shop for miles…

Tomorrow…it will work like this…a chip in the engine detects an impending failure and sends a notification not only to you but also via satellite to the nearest repair shop, the nearest parts source, and, if necessary, the nearest auto rental shop…and also to the manufacturer of the part so failure rates can be tracked and inventories adjusted…Wow! A global supply chain in which everyone

C3 Vision (v 2.0) 2002

TODAY… If an expeditionary military mission requiring ground forces is directed, it is often given primarily to a single service….witness the Marines at Kandahar, the earlier Army Ranger raid at that same airfield during the early days of Opn Enduring Freedom…and Army-centric Opn Anaconda.

WHY?

In large measure, because today our C3 systems are developed, procured, and deployed by our Services with minimal interoperability.

TOMORROW….These missions will be conducted by seamlessly integrated and inter-netted joint forces.

IT WILL WORK LIKE THIS:

The President determines that a country or organization must be swiftly defeated. The responsible Regional Combatant Commander, provided accurate, real-time knowledge of the readiness and location of all US forces, as well as reach-back to national level expertise by the Joint C2 System, builds a joint force package that optimizes the capabilities of each Service and SOCOM. Using this same Joint C2 System, the designated Joint Task Force Commander plans and rehearses the mission virtually in a secure, collaborative information environment. At the same time, using several UAVs, he establishes a Wide Area Relayed Network (WARNET) over the objective area. The JTF moves toward the target from dispersed bases, maintaining constant situational awareness and collaboration while enroute. Upon arrival, elements of the force, with common situational understanding from the Joint C2 system, deliver devastating, closely synchronized, kinetic and non-kinetic joint effects …no boundaries…no coordination lines. The enemy destroyed, elements of the JTF secure objectives, others return to base…. still sharing common situational understanding. The Commander of NORTHCOM uses this same Joint C2 System to share Homeland Defense information amongst it's Service Components and with other Agencies.

WOW!

National Leadership, Combatant Commander, Joint Force Commander, Component Commanders, and Service and SOCOM tactical elements – at home and abroad - all seamlessly networked by an integrated Joint C2 System….not a collection of Service-centric systems and connected nets and websites but a pervasive, ubiquitous information-centric infrastructure….a powerful vision.

The Big Idea: Automate routine, rules based processes so warfighters spend brainpower solving tough problems…

- Two Scenarios…
  - Time Sensitive Targeting/Adaptive Planning
  - Information Management in Net-Centric Operations

- Thanks up front to:
  - Doug Miller, Gary Shaffer, and Marty Hendrix of SAIC
  - Rick Hays-Roth, MAJ Bob Hesser, LCDR Dan Reiken of Naval Post Grad School
  - Geoff Brown and Tom Mayhew of Oracle

Enablers…

- Standards based tools
- Evolution of the “GIG”…commercial and military
- Emergence of Service (Process) Oriented Architectures tying together loosely-coupled and geographically dispersed services
- Evolution of the vision of the “Semantic Web” where data is defined and linked in such a way that it is used by machines, not just displayed

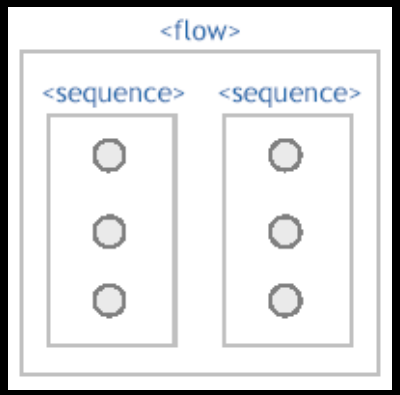
- Willingness to share data and information for operational effectiveness and cost savings

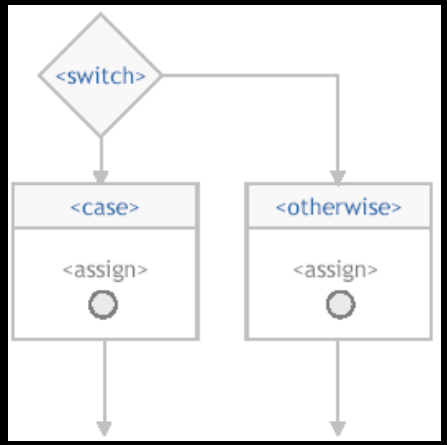
Time Sensitive Targeting and Adaptive Planning

- Today…
  - We partially automate mission planning, preparation, and execution, but many processes are fragile, not too flexible, and not optimized
- Tomorrow…
  - We will leverage the power of modern information technology to weave together services and processes into a seamless, flexible system that optimizes modern information technology

Its based on standard versions of Extensible Markup Language (XML)…

- <invoke> a web service synchronously
- <assign> and manipulate XML documents
- <scope>, <faultHandlers> catch and manage exceptions
- Initiate asynchronous processing in parallel <flow> of execution
- <receive> asynchronous callbacks from long running services/processors
- <switch> on a set of pre-defined constraints





…woven into Business Process Execution Language (BPEL)…

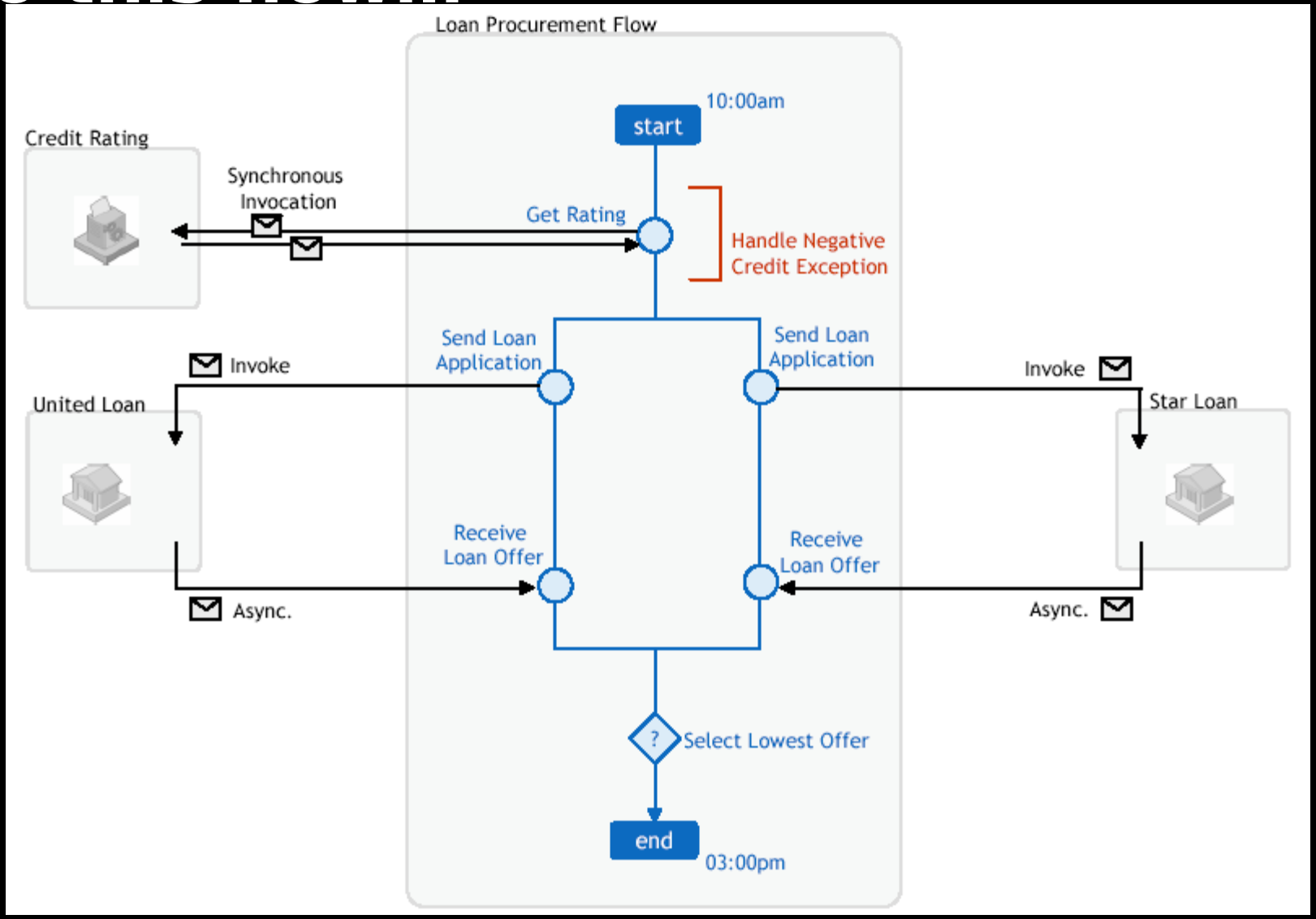
```
    <!-- ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
     ORCHESTRATION LOGIC: Set of activities coordinating the flow of
     messages across the services integrated within this business process
     ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ -->
    <sequence name="main">
        <!-- Receive input from requestor.
             Note: This maps to operation defined in HpacClient.wsdl
             -->
        <receive name="receiveInput" partnerLink="client" portType="tns:HpacClient" operation="initiate" variable="input"
                 createInstance="yes"/>
        <!-- Asynchronous callback to the requester.
             Note: the callback location and correlation id is transparently handled
             using WS-addressing.
             -->
        <assign><copy>
                <from variable="input" part="parameters" query="/HpacClientRequest/lat">
                </from>
                <to variable="hpacRequest" part="lat"/>
            </copy>
            <copy>
                <from variable="input" part="parameters" query="/HpacClientRequest/lon">
                </from>
                <to variable="hpacRequest" part="lng"/>
            </copy>
        </assign><invoke partnerLink="hpacWS" portType="WSClient:WSClient" operation="getCasualityInfo" inputVariable="hpacRequest"
                    outputVariable="hpacResponse"/><invoke partnerLink="hpacWS" portType="WSClient:WSClient" operation="getShapeFile"
                    inputVariable="shapeRequest" outputVariable="shapeResponse"/><assign><copy>
                <from variable="shapeResponse" part="getShapeFileReturn">
                </from>
                <to variable="output" part="parameters" query="/HpacClientResult/result"/>
            </copy>
        </assign><invoke name="callbackClient" partnerLink="client" portType="tns:HpacClientCallback" operation="onResult"
                         inputVariable="output"/>
    </sequence>
</process>
```

…that enables the Orchestration of Web Services

- Compose Operational Processes and Threads, from Business Process Execution Language (BPEL) based on common standards
- Specifies how collections of services are jointly used to realize more complex functionality
  - Describes the data shared between the services
  - Transactional states and joint exception handling
  - Separates the flow (execution) from the services themselves
  - Partnerships/Organizations
- Once deployed they can be consumed by other Operational Processes and/or services

XML based Work flow for Web services

BTW: Your bank and “Lending Tree” do this now…

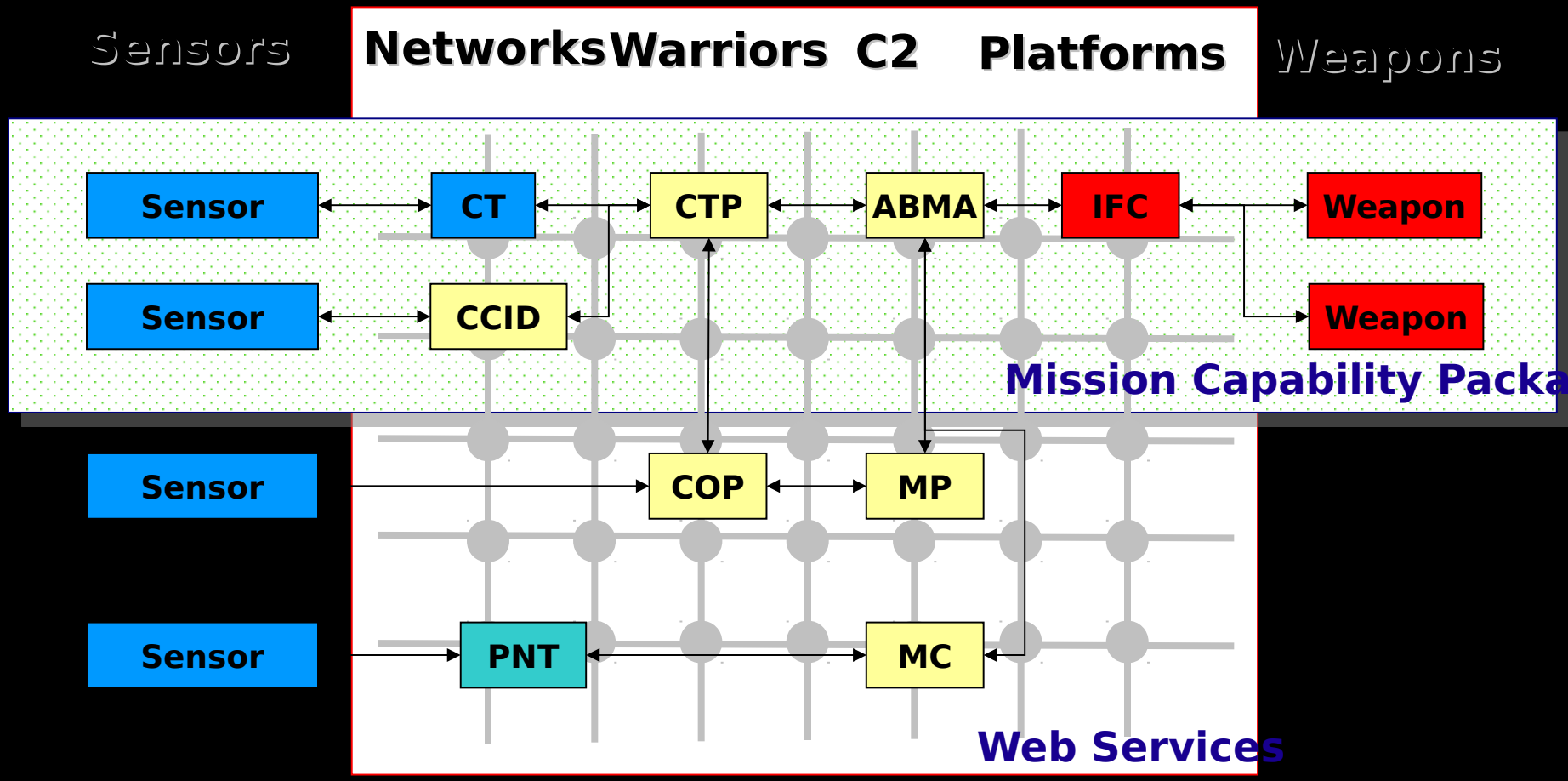


Mission Capability Packages…

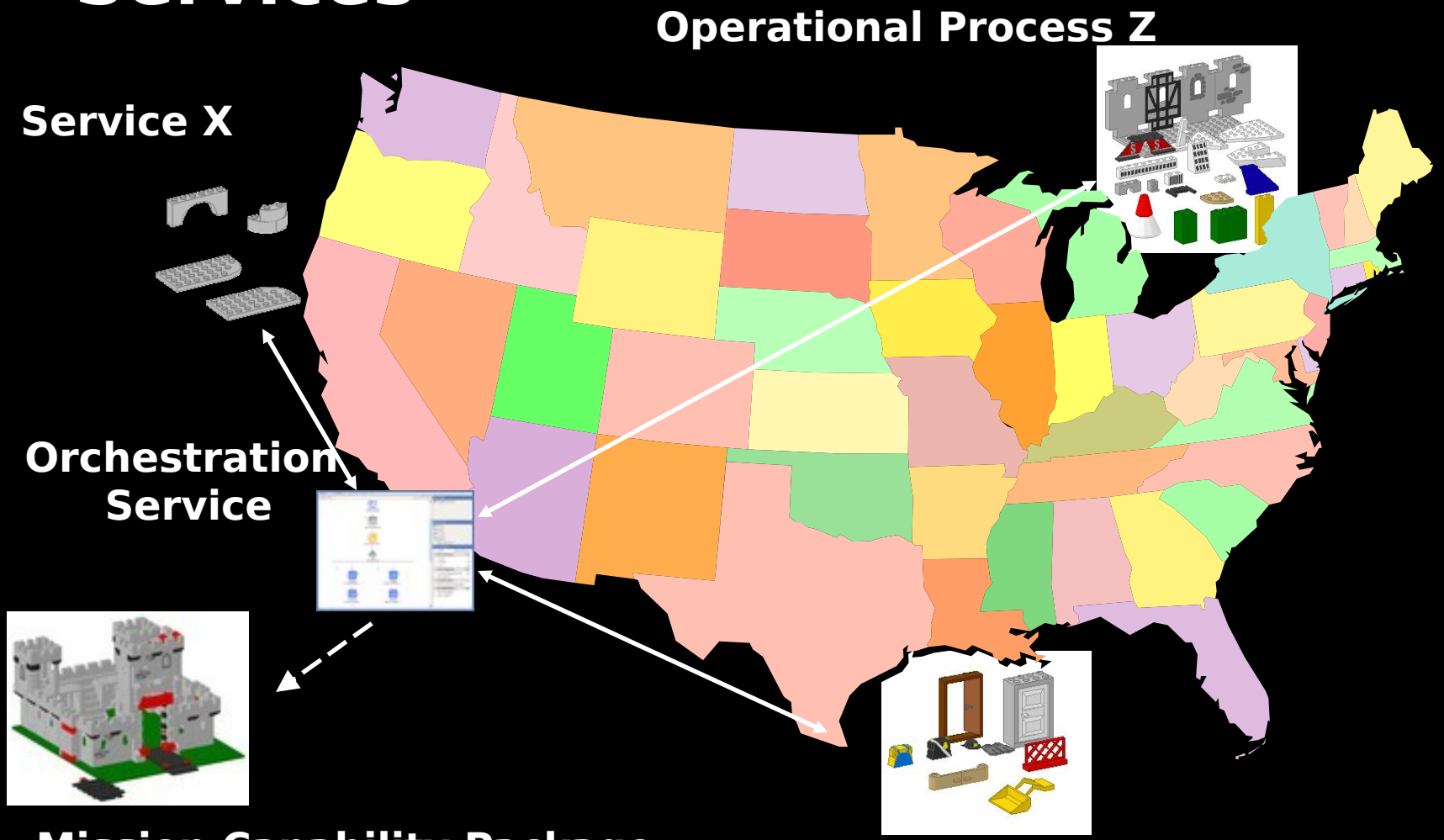
- Integrate a specific set of joint sensors, platforms, weapons, warriors, networks, command and control systems for the purpose of performing mission-specific engagements.
- Ability to dynamically re-configure and re-allocate assets “on the fly” based on current mission needs.

FnEP Masters Thesis, NPS, MAJ Robert Hesser and LCDR Dan Rieken

Mission Capability Packages

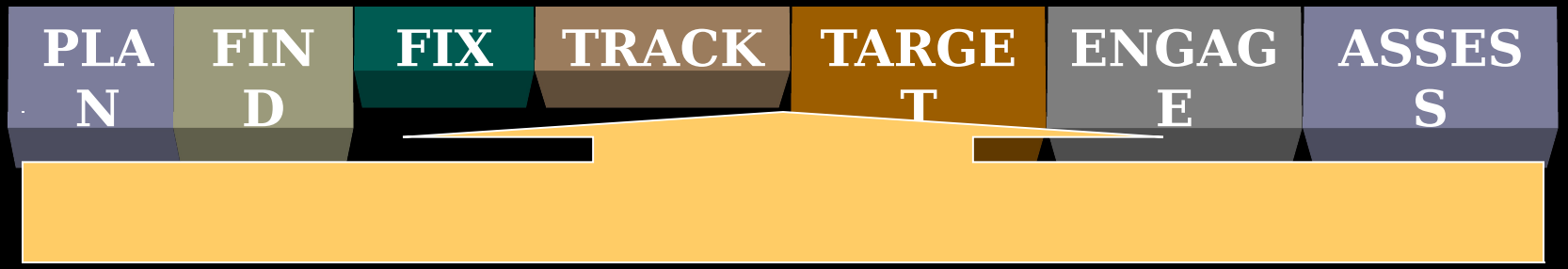


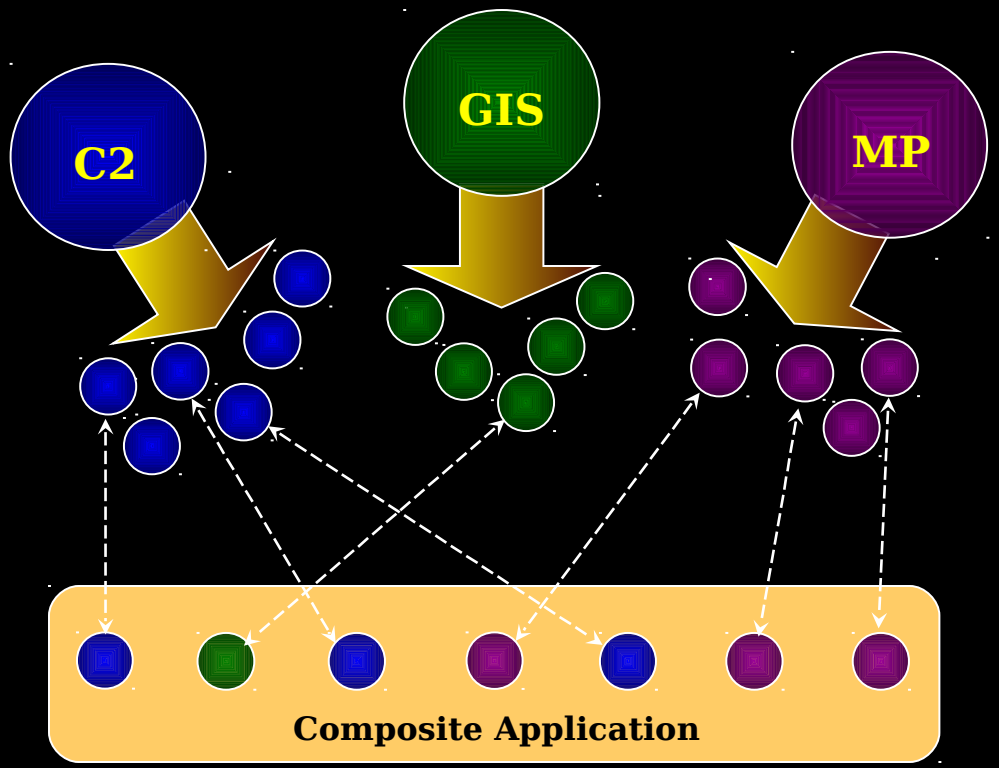
Orchestrating Distributed Services



Mission Capability Package composed and orchestrated from services X, Y, & OP Z

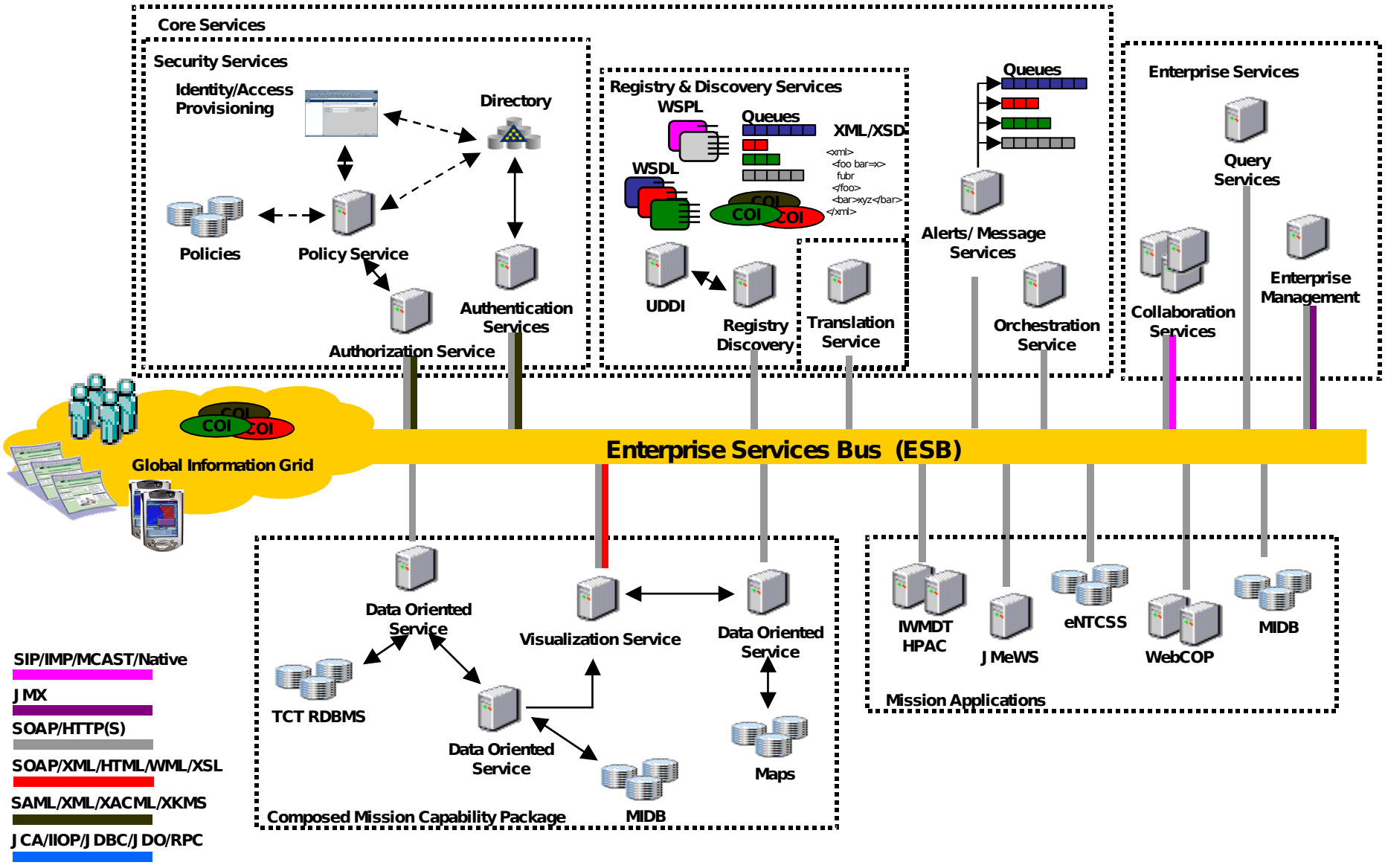
Technology Vision Applied



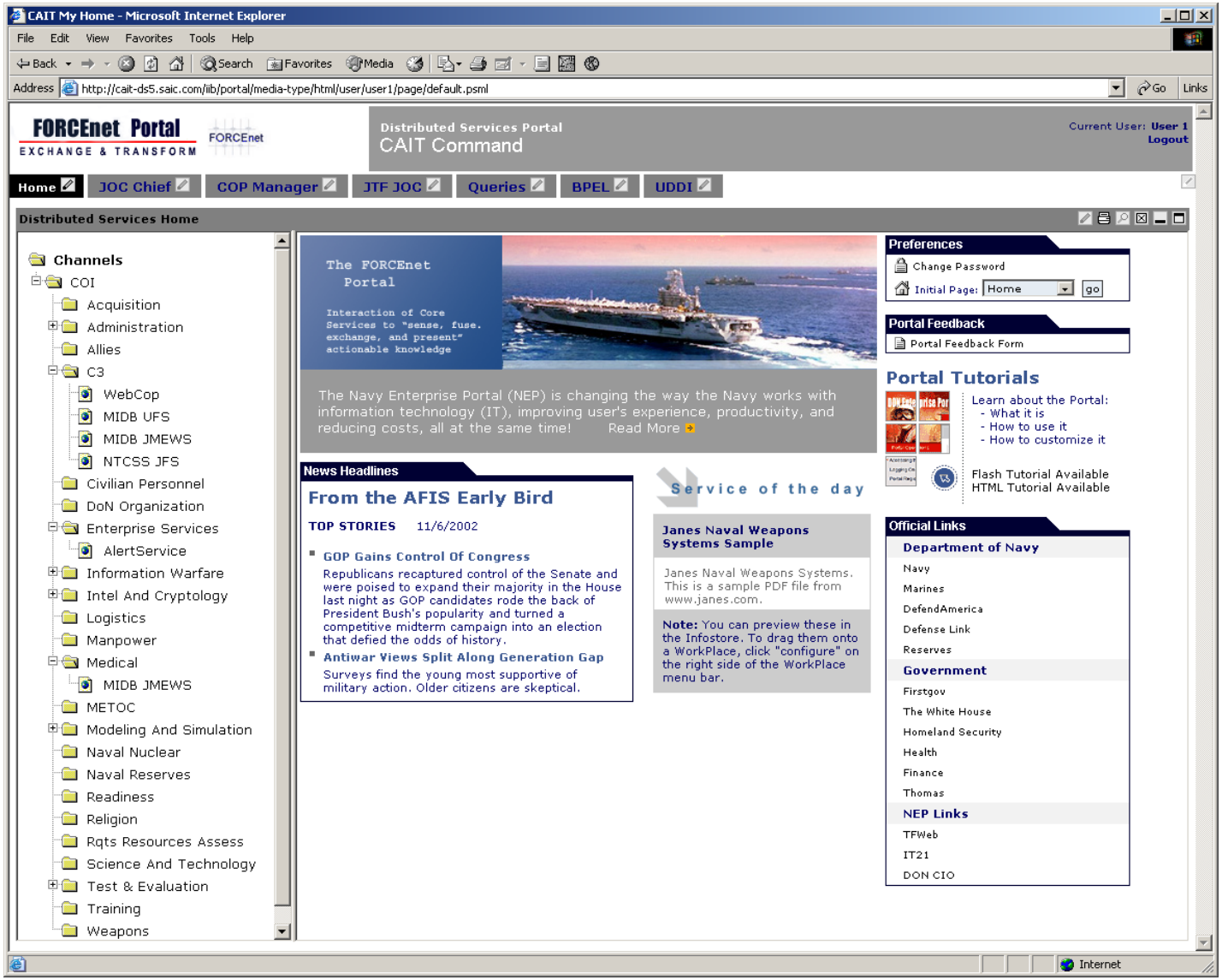


- Deliver components rather than systems
- Components are provided as information services
- Components can be arranged in any way to provide overall composite application
- Component design provides flexibility, higher re-use, and better manageability

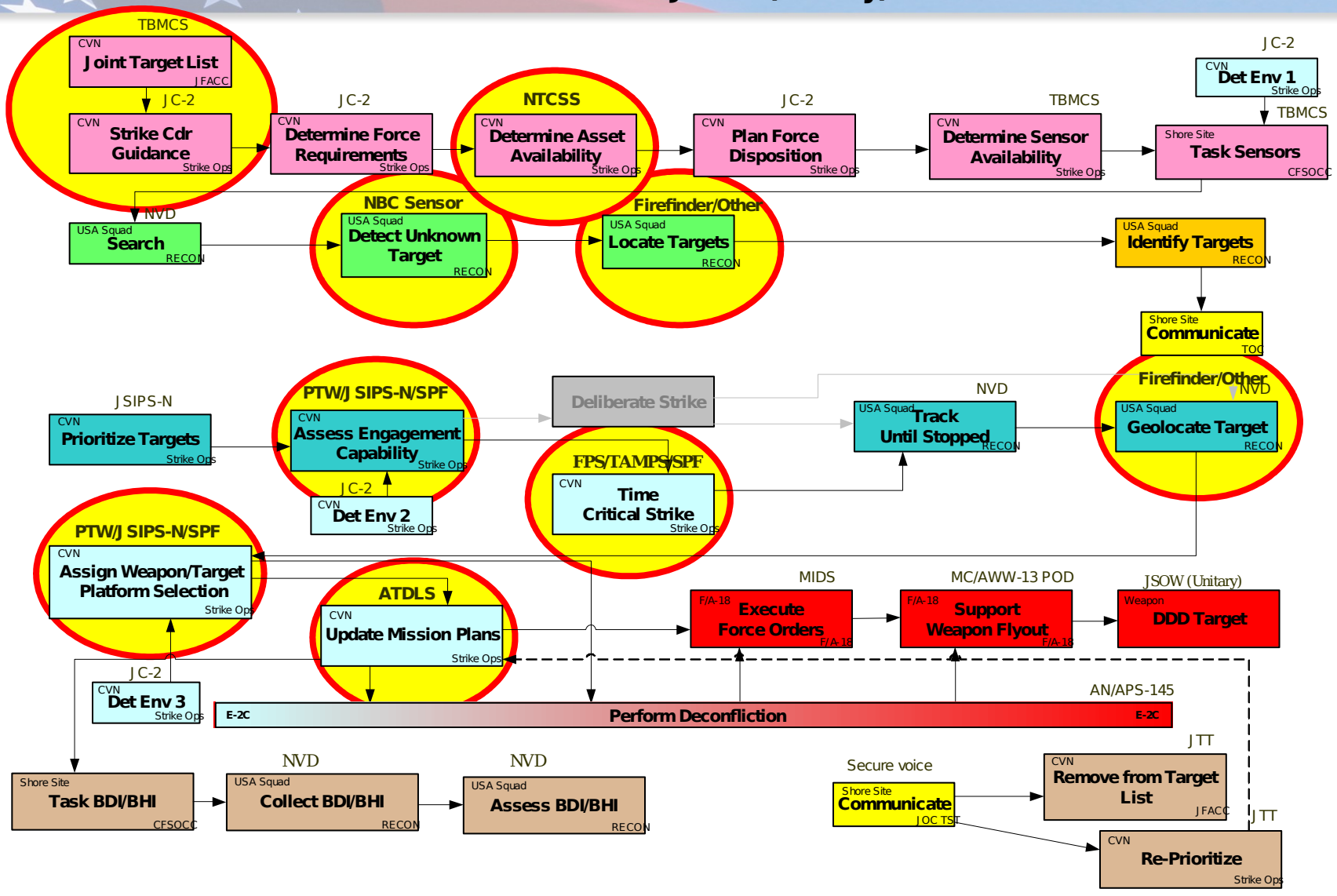
SAIC
An Employee-Owned Company



Portal with Discovery



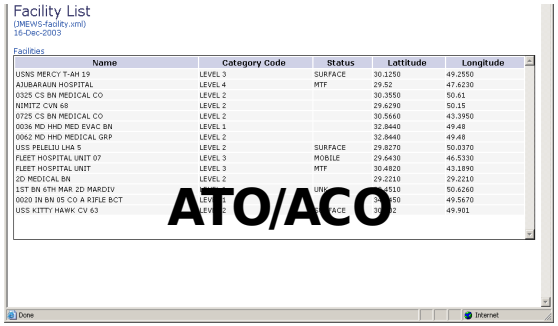
Scenario - MTW-W
TACSIT - Strike Against Re-Locatable Soft Target
Use Case - F/A-18 w/J SOW (Unitary)



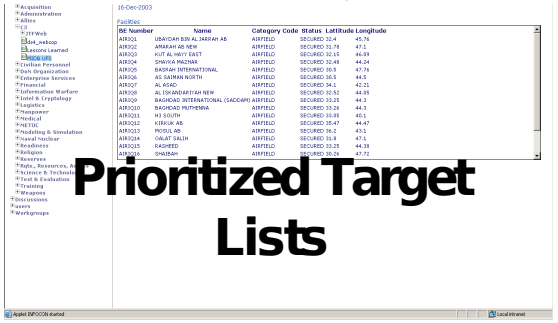
An Employee-Owned Company

Time Sensitive Targeting

From TBMCS (via SPF)



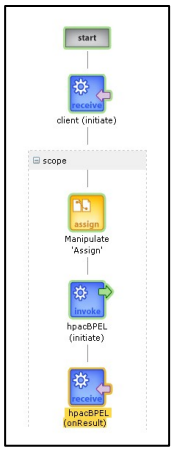
From J IPTL and J TL



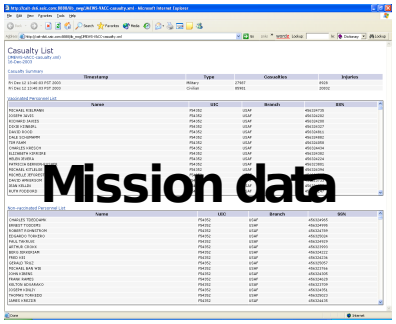
ATO/ACO

Prioritized Target Lists

BPEL

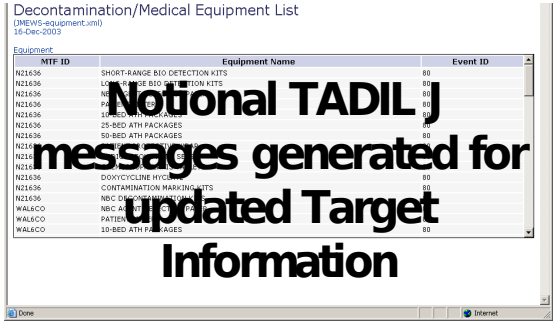


From SPF



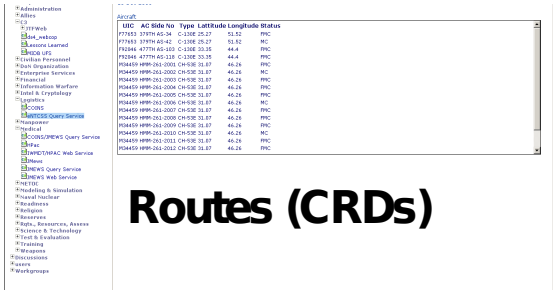
Mission data

To ABM



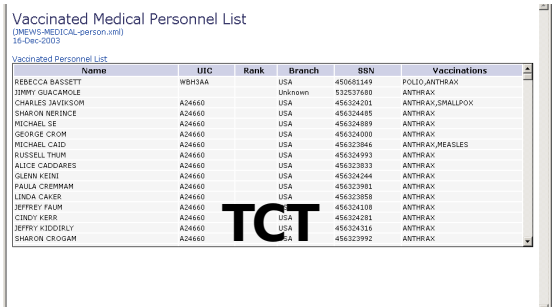
Notional TADIL J messages generated for updated Target Information

From SPF



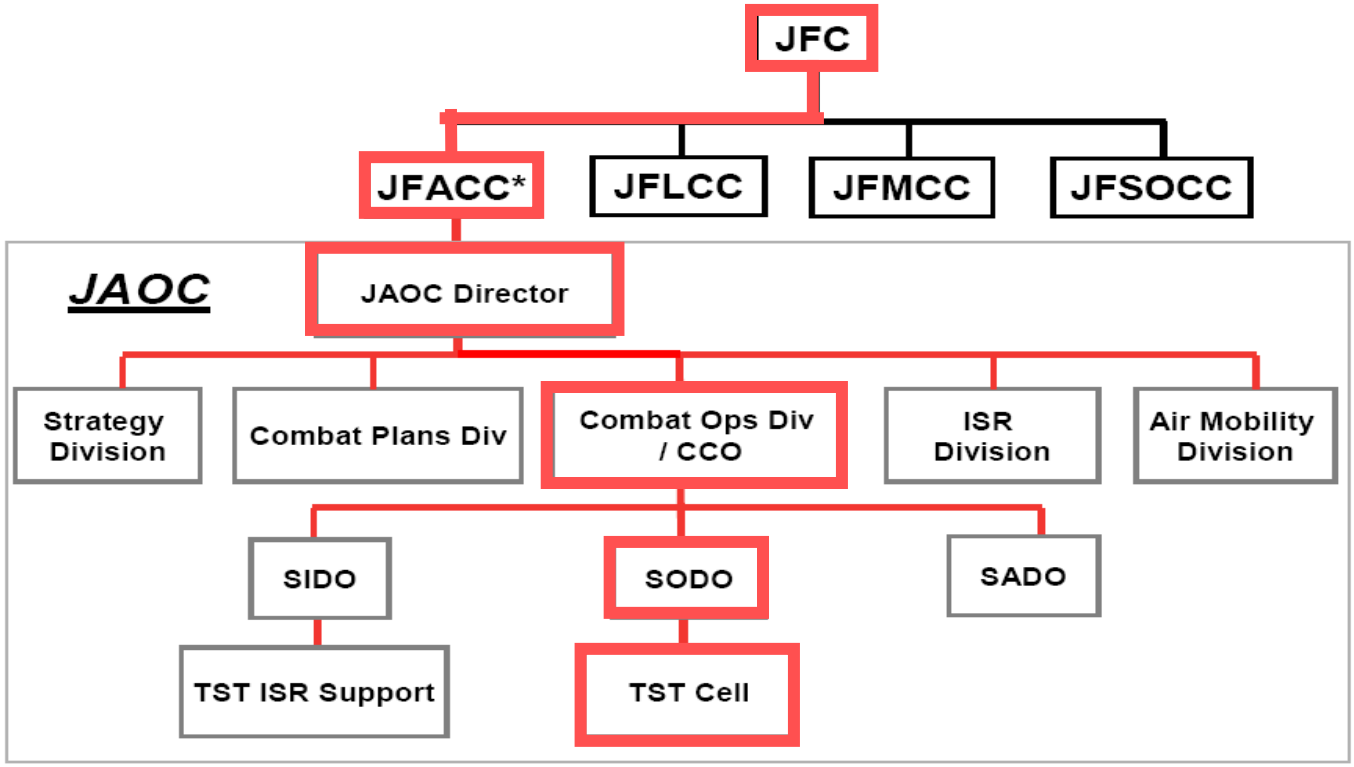
Routes (CRDs)

From COP



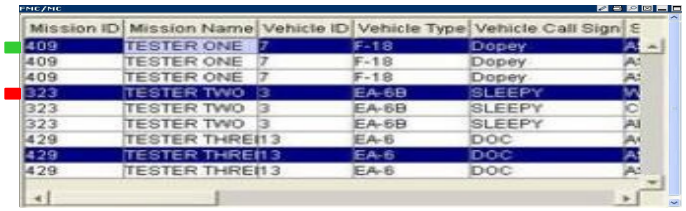
TCT

JAOC Procedures

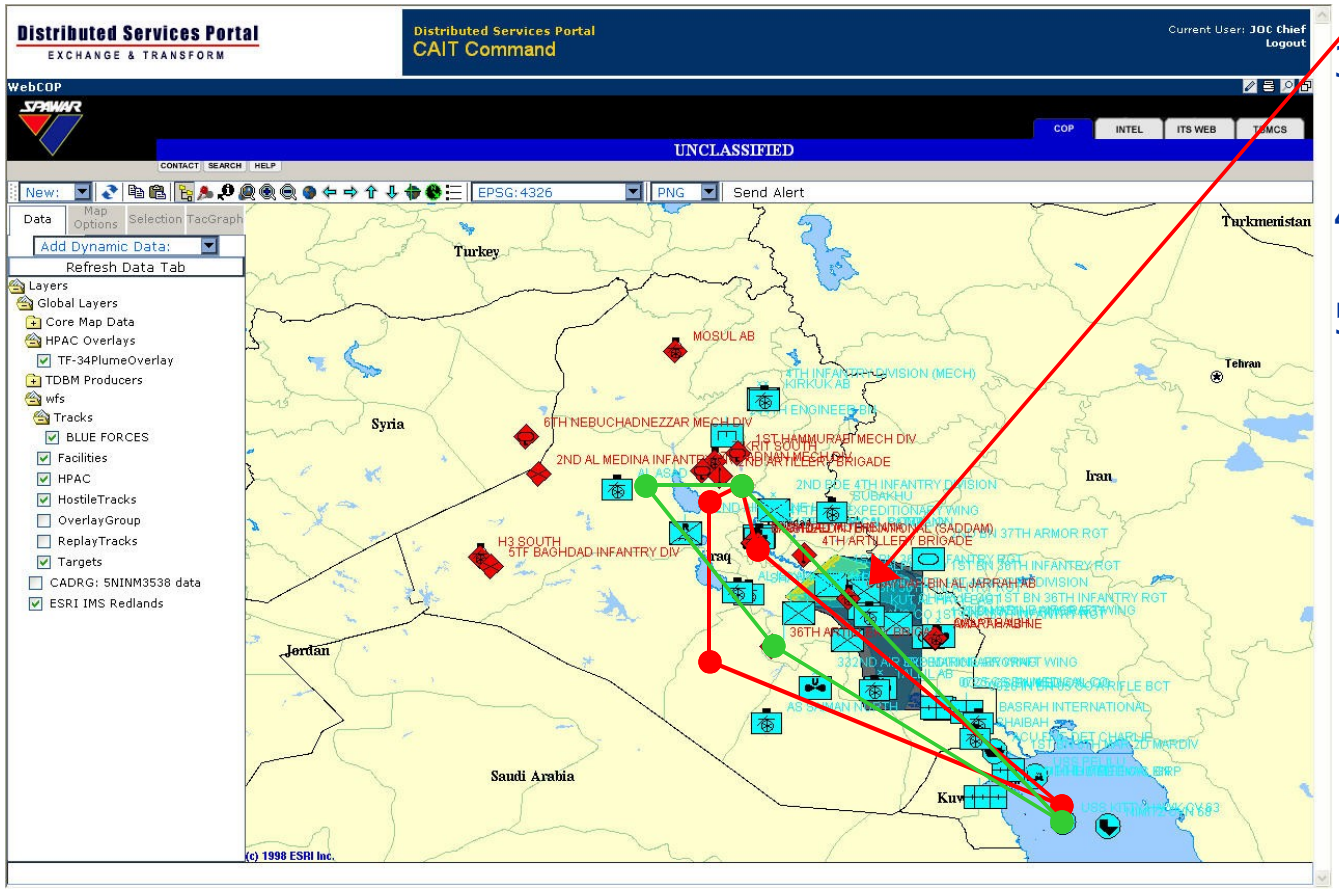


**In most cases, the COMAFFOR will also be the JFACC*

AOC TCT Cell fuses routes, mission data



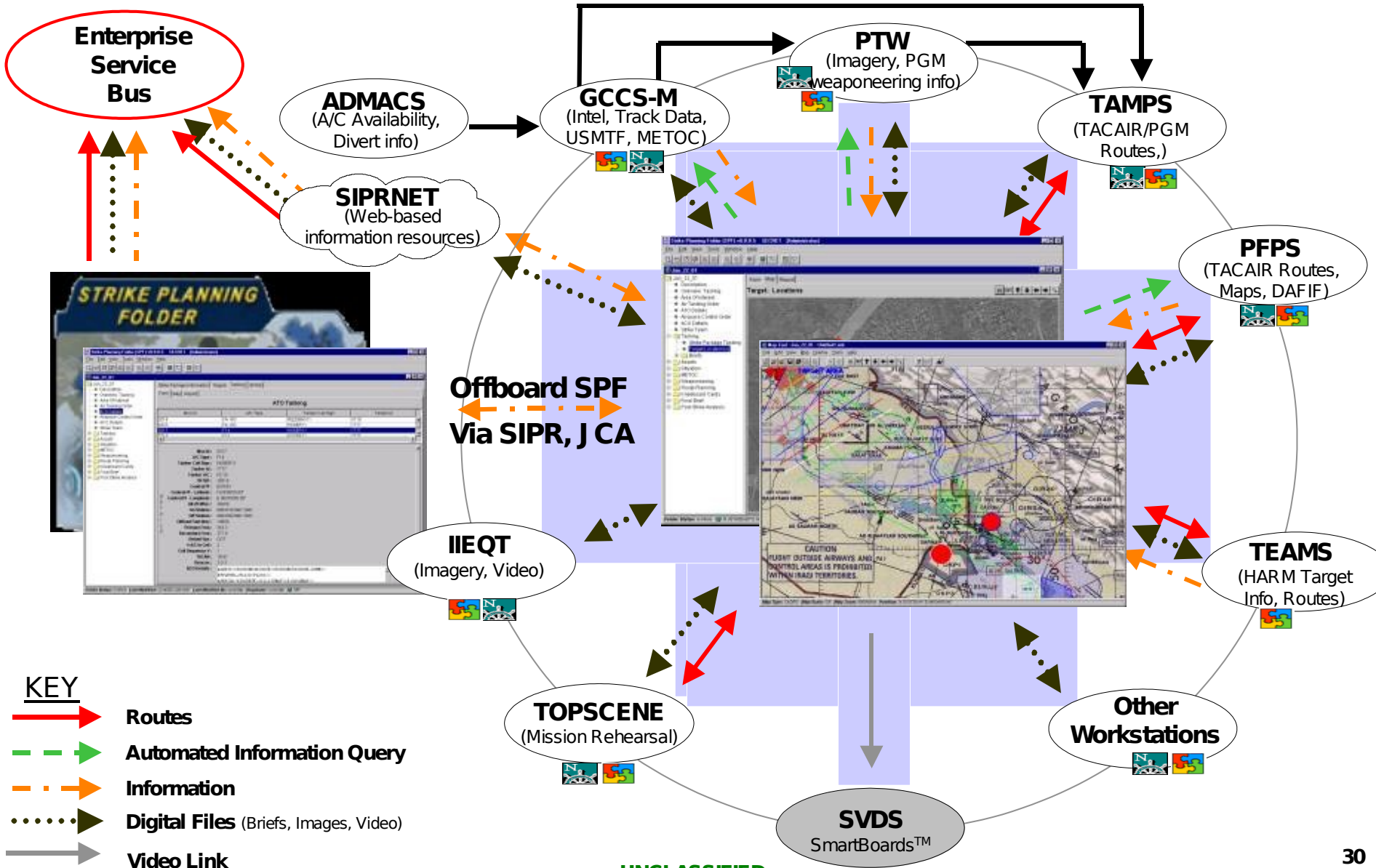
Mission ID	Mission Name	Vehicle ID	Vehicle Type	Vehicle Call Sign
409	TESTER ONE	7	F-18	Dopey
409	TESTER ONE	7	F-18	Dopey
409	TESTER ONE	7	F-18	Dopey
323	TESTER TWO	3	EA-6B	SLEEPY
323	TESTER TWO	3	EA-6B	SLEEPY
323	TESTER TWO	3	EA-6B	SLEEPY
429	TESTER THREE	13	EA-6	DOC
429	TESTER THREE	13	EA-6	DOC
429	TESTER THREE	13	EA-6	DOC



1. Missions that met some criteria are displayed in the Missions portlet
2. Corresponding routes are displayed in COP
3. TCT Cell determines weapon/target pairing for given TCT
4. Get approval from JCB, JAG, and Coalition
5. Through new automated approaches such as OBMS and MBMS, TCT cell generates a divert alert to shooters and publishes the COA to the JTF.JFACC.ABM topic

Operational Battle Management System
Mission Battle Management System

Strike Planning Today with SPF



Valued Information in Real Time (VIRT)

- **Today…**

  While we talk about Net-centric operations in which Joint, coalition, ad hoc operations "integrate seamlessly" and "share a common understanding", each operator gets all needed information, cycle times drastically reduced, and cooperating units self synchronize…and we posit that plentiful information & unlimited bandwidth will make it so…actually, people don't make good decisions when they are time-stressed and overloaded with information

- **Tomorrow…**

  We will synchronize groups by having them operate on semantically aligned and high-value information, we will determine what concepts operators' missions depend on and make those standard, we will notice what beliefs underlie mission plans and COAs, we will automatically inform operators when data changes affect their beliefs and plan rationales, and we will create an open market for delivering valued information to users

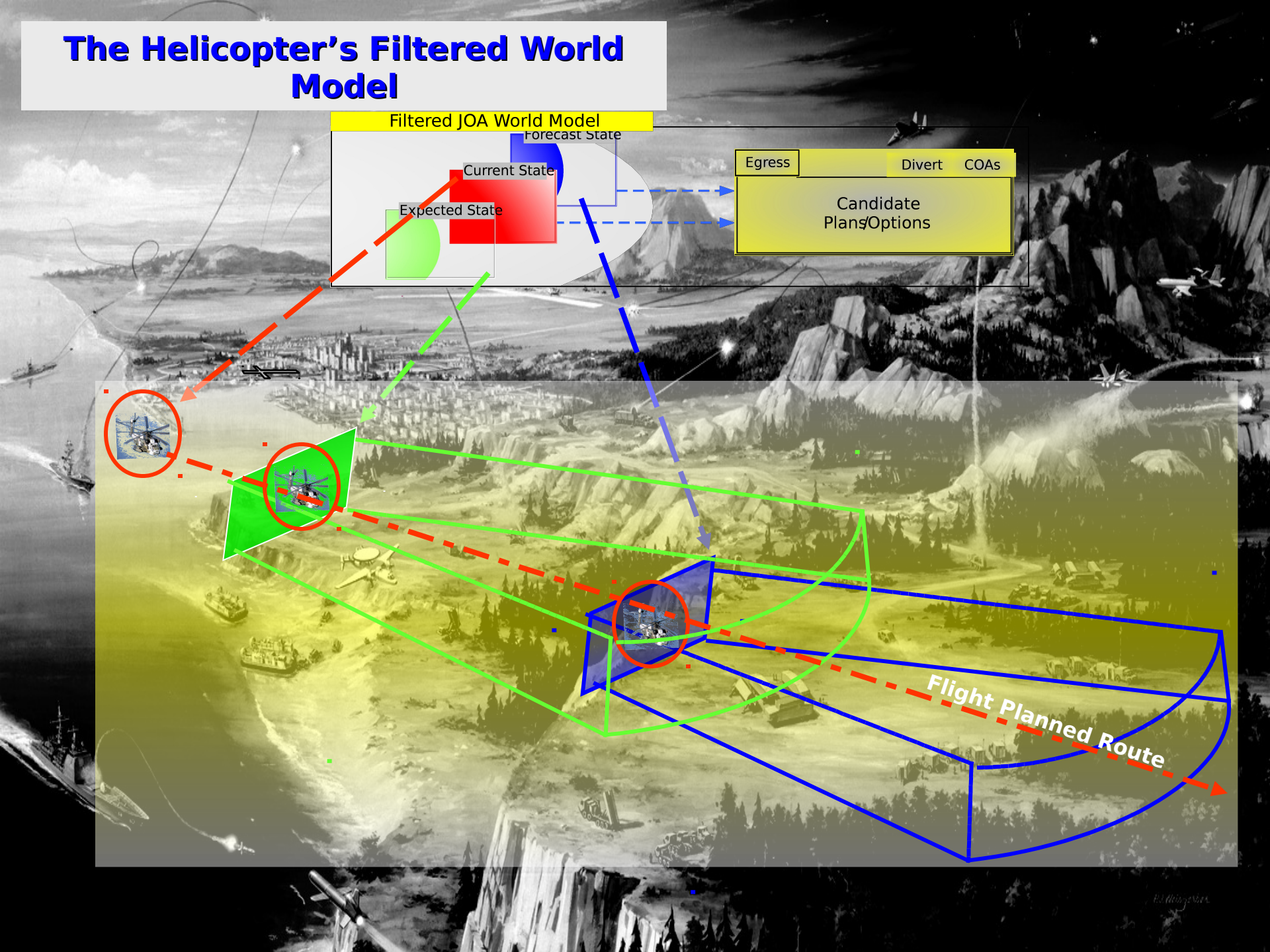
Idea: A Model-based Communication Network

- "State-Full" vice "State-Less" Networking
  - Maintain shared state among collaborators
  - State = current values of models, *e.g.*
    - The route plan, position, velocity of an aircraft
    - The current and future position and behavior of a unit
    - The hypothesized position, status and intention of a system
- A shared world model is the goal
  - Collectively, what the collaborators believe
  - Distributed, replicated for efficiency
  - Autonomously updated, through dead-reckoning
- Like a distributed blackboard of hypotheses
  - Re-conceptualize Common Operational Picture
  - Obviate "communication" of non-news
  - Emphasize "information," especially valuable information

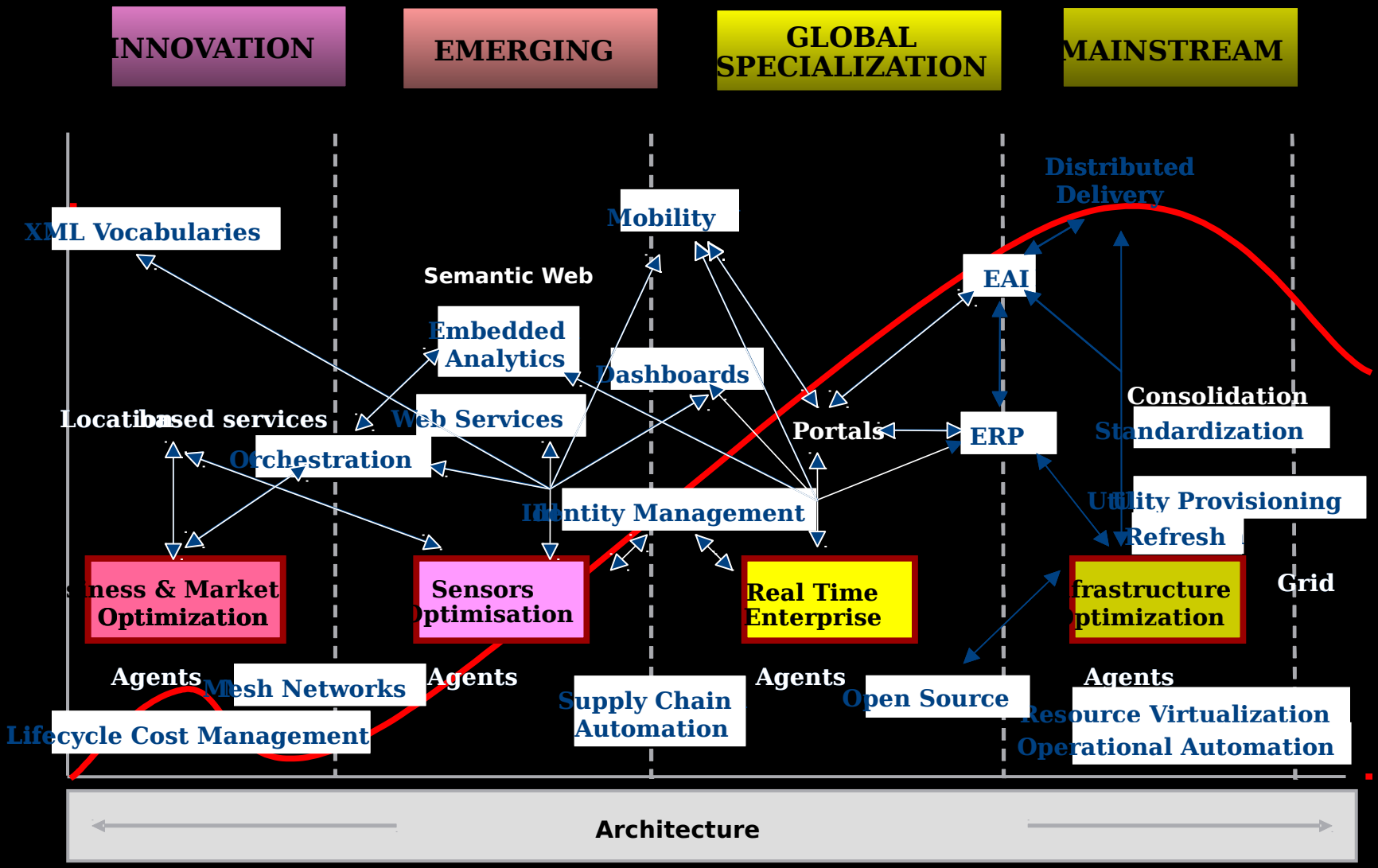
Examples

- Pilots need weather information
  - Planning, Monitoring, Executing phases
  - Mission phases: Take-off, En Route, Descent, Approach, Land
  - Phase-specific risks
  - Weather information affects risks
  - Operator preferences alter risk assessment
- SEALS need weather information
  - Similar to above, but phases: approach, swim, land, …
  - Weather affects risks, such as detection

The Helicopter's Filtered World Model



Summary: Infrastructure Evolution



Cautions…and conclusion

- It ain’t just “hype”, the potential is real, and the importance cannot be understated..
  - But ….effective execution is hard…know your limitations, start small then scale fast…
- Hurdles of culture, process and willingness to share information all must be overcome…with the right incentives
- The enemy gets a vote…

- It’s all about leadership and organizational commitment

QUESTIONS
ANSWERS
&
ORACLE